

WHAT IS CLAIMED IS:

- 1 1. A method comprising:
2 receiving image data; and
3 executing an averaging instruction to average a plurality of pixels of the image
4 data;
5 wherein executing the averaging instruction generates a set of four-pixel averages,
6 each four-pixel average generated from two pixels in a first source register
7 and two pixels in a second source register; and
8 wherein executing the averaging instruction comprises:
9 adding successive pixels from the first source register to successive pixels
10 of the second source register generating a plurality of intermediate
11 results; and
12 adding two of the plurality of intermediate results and repeating with
13 different combinations of the plurality of intermediate results
14 generating a plurality of sum results.
- 15 2. The method as recited in Claim 1, wherein the two pixels in the first source
16 register and the two pixels in the second source register are adjacent pixels in an image.
- 17 3. The method as recited in Claim 2, wherein the adjacent pixels are adjacent in
18 both horizontal and vertical dimensions.
- 19 4. The method as recited in Claim 1, wherein the executing the averaging
20 instruction further comprises:

discarding the two least significant bits of each sum result of the plurality of sum results generating the set of four-pixel averages.

5. The method as recited in Claim 1, wherein the first source register comprises a plurality of pixels from a first row of pixels and the second source register comprises a plurality of pixels from a second row of pixels, and wherein the first row is adjacent to the second row in an image.

6. The method as recited in Claim 5, further comprising:
repeating the executing the averaging instruction for all pixels in the image; and
discarding a portion of generated four-pixel averages, generating a down-scaled image.

7. The method as recited in Claim 6, wherein the discarding the portion of the generated four-pixel averages comprises:
masking every other four-pixel average using a AND operation;
executing a pack instruction that compresses two eight element registers into a single eight element register generating the down-scaled image.

8. The method as recited in Claim 1, wherein the set of four-pixel averages comprise interpolated pixel values utilized for video coding.

9. The method as recited in Claim 8, wherein the video coding is a motion estimation encoding.

40 10. The method as recited in Claim 8, wherein the video coding is a motion
41 compensation decoding.

42 11. The method as recited in Claim 1, wherein the set of four-pixel averages are
43 utilized for image color space conversion.

44 12. The method as recited in Claim 1, wherein the set of four-pixel averages are
45 utilized for image color format conversion.

46 13. The method as recited in Claim 1, wherein the first source register comprises a
47 plurality of pixels from a first row of pixels and the second source register comprises a
48 plurality of pixels from a second row of pixels, and wherein the first row is from a
49 different image than the second row.

50 14. The method as recited in Claim 13, wherein the set of four-pixel averages
51 comprise averaged pixel values utilized for motion estimation video encoding.

52 15. The method as recited in Claim 13, wherein the set of four-pixel averages
53 comprise averaged pixel values utilized for motion compensation video decoding.

54 16. The method as recited in Claim 1, wherein the averaging instruction is a
55 Single-Instruction/Multiple-Data (SIMD) instruction.

56 17. The method as recited in Claim 1, wherein the first source register comprises a
57 plurality of pixels from a row of pixels and the second source register comprises another

plurality of pixels from the row of pixels, and wherein each pixel of the plurality of pixels is adjacent in an image to at least one pixel of the another plurality of pixels.

18. The method as recited in Claim 17, wherein the executing the averaging instruction comprises a portion of a separable filter implementation.

19. A system comprising:

an addressable memory to store an instruction for an averaging operation;

a processing core coupled to the addressable memory, the processor core

comprising:

an execution core to access and execute the instruction;

a first source register to store a first plurality of pixels;

a second source register to store a second plurality of pixels; and

a destination register to store a plurality of results of the averaging

operation;

a wireless interface to receive a digital signal comprising a third plurality of

pixels; and

an I/O system to provide the first and second plurality of pixels to the first and

second source registers from the third plurality of pixels;

wherein to execute the instruction, the execution core is operative to:

generate a set of four-pixel averages, each four-pixel average generated

from two pixels in the first source register and two pixels in the

second source register.

79 20. The system as recited in Claim 19, wherein to generate the set of four-pixel
80 averages the execution core is operative to:
81 add successive ones of the first plurality of pixels to successive ones of the second
82 plurality of pixels generating a plurality of intermediate results;
83 add two of the plurality of intermediate results and repeating with different
84 combinations of the plurality of intermediate results generating a plurality
85 of sum results; and
86 discard the two least significant bits of each sum result of the plurality of sum
87 results generating the set of four-pixel averages.

88 21. The system as recited in Claim 19, wherein the first source register comprises
89 a plurality of pixels from a first row of pixels and the second source register comprises a
90 plurality of pixels from a second row of pixels, and wherein the first row is adjacent to
91 the second row in an image.

92 22. The system as recited in Claim 19, wherein the first source register comprises
93 a plurality of pixels from a first row of pixels and the second source register comprises a
94 plurality of pixels from a second row of pixels, and wherein the first row is from a
95 different image than the second row.

96 23. The system as recited in Claim 19, wherein the first source register comprises
97 a plurality of pixels from a row of pixels and the second source register comprises
98 another plurality of pixels from the row of pixels, and wherein each pixel of the plurality
99 of pixels is adjacent in an image to at least one pixel of the another plurality of pixels.

100 24. The system as recited in Claim 19, wherein the averaging instruction is a
101 Single-Instruction/Multiple-Data (SIMD) instruction.

102 25. A system comprising:

103 an addressable memory to store an instruction for an averaging operation;

104 a processing core coupled to the addressable memory, the processor core

105 comprising:

106 an execution core to access and execute the instruction;

107 a first source register to store a first plurality of pixels;

108 a second source register to store a second plurality of pixels; and

109 a destination register to store a plurality of results of the averaging

110 operation;

111 a video capture interface to receive a digital signal comprising a third plurality of

112 pixels; and

113 an I/O system to provide the first and second plurality of pixels to the first and

114 second source registers from the third plurality of pixels;

115 wherein to execute the instruction, the execution core is operative to:

116 generate a set of four-pixel averages, each four-pixel average generated

117 from two pixels in the first source register and two pixels in the

118 second source register.

119 26. The system as recited in Claim 25, wherein the first source register comprises
120 a plurality of pixels from a first row of pixels and the second source register comprises a

121 plurality of pixels from a second row of pixels, and wherein the first row is adjacent to
122 the second row in an image.

123 27. The system as recited in Claim 25, wherein the first source register comprises
124 a plurality of pixels from a first row of pixels and the second source register comprises a
125 plurality of pixels from a second row of pixels, and wherein the first row is from a
126 different image than the second row.

127 28. The system as recited in Claim 25, wherein the first source register comprises
128 a plurality of pixels from a row of pixels and the second source register comprises
129 another plurality of pixels from the row of pixels, and wherein each pixel of the plurality
130 of pixels is adjacent in an image to at least one pixel of the another plurality of pixels.

131 29. The system as recited in Claim 25, wherein the instruction is a Single-
132 Instruction/Multiple-Data (SIMD) instruction.

133 30. An article comprising a machine-readable medium that includes machine
134 readable instructions, the instructions operative to cause a machine to:
135 receive image data; and
136 execute an averaging instruction to average a plurality of pixels of the image data,
137 wherein executing the averaging instruction generates a set of four-pixel
138 averages, each four-pixel average generated from two pixels in a first
139 source register and two pixels in a second source register.

140 31. The article as recited in Claim 30, wherein the first source register comprises a
141 plurality of pixels from a first row of pixels and the second source register comprises a
142 plurality of pixels from a second row of pixels, and wherein the first row is adjacent to
143 the second row in an image.

144 32. The article as recited in Claim 31, wherein the instructions are further
145 operative to cause the machine to:
146 repeat the executing the averaging instruction for all pixels in the image; and
147 discard a portion of generated four-pixel averages, generating a down-scaled
148 image.

149 33. The article as recited in Claim 32, wherein the instructions operative to cause
150 the machine to discard the portion of generated four-pixel averages comprise:
151 an AND instruction to mask alternating four-pixel averages; and
152 a PACK instruction to compress two eight element registers into a single eight
153 element register to generate the down-scaled image.

154 34. The article as recited in Claim 30, wherein the first source register comprises a
155 plurality of pixels from a first row of pixels and the second source register comprises a
156 plurality of pixels from a second row of pixels, and wherein the first row is from a
157 different image than the second row.

158 35. The article as recited in Claim 30, wherein the averaging instruction is a
159 Single-Instruction/Multiple-Data (SIMD) instruction.

160 36. The article as recited in Claim 30, wherein the averaging instruction is
161 operative to cause the machine to:
162 add successive pixels from the first source register to successive pixels of the
163 second source register generating a plurality of intermediate results;
164 add two of the plurality of intermediate results and repeating with different
165 combinations of the plurality of intermediate results generating a plurality
166 of averaging results; and
167 discard the two least significant bits of each averaging result of the plurality of
168 averaging results generating the set of four-pixel averages.

169 37. The article as recited in Claim 30, wherein the first source register comprises a
170 plurality of pixels from a row of pixels and the second source register comprises another
171 plurality of pixels from the row of pixels, and wherein each pixel of the plurality of pixels
172 is adjacent in an image to at least one pixel of the another plurality of pixels.

173 38. The article as recited in Claim 37, wherein the executing the averaging
174 instruction comprises a portion of a separable filter implementation.